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Amendments to the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for removing or otherwise reducing the level of certain chemical compounds ~~species~~ in a sample, said method comprising subjecting said sample to at least one ~~or both~~ of anaerobic treatment and ~~conditions and/or~~ aerobic treatment ~~conditions~~ wherein the valency of one or more redox mediator species is manipulated by microorganisms resulting in adsorption, precipitation, aggregation, flotation, or flocculation of the chemical compounds ~~species~~.

2. (Currently Amended) The method of Claim 1 wherein under anaerobic conditions, the redox mediator species are reduced to a lower order valency, and under aerobic conditions, redox mediator species are oxidized to a higher order valency by microorganisms, and wherein ~~this in turn facilitates~~ the formation of insoluble particles comprising the particular chemical compounds ~~is facilitated~~ ~~species~~.

3. (Currently Amended) The method of Claim 2 wherein the chemical compounds ~~species~~ comprise inorganic molecules.

4. (Currently Amended) The method of Claim 2 wherein the chemical compounds ~~species~~ comprise organic molecules.

5. (Currently Amended) The method of Claim 2 ~~3 or 4~~ wherein the chemical compounds ~~species~~ comprise one or more of proteins, fatty acids, lipids, ammonium, organic acids, phenolic compounds, aromatic polycyclic oxygenated

compounds, nucleic acids, sulfates, phosphates, radionuclides and ~~and/or~~ cyanides.

6. (Currently Amended) The method of Claim 1 wherein the sample is ~~a~~ liquid, semi-liquid, solid, particulate or gaseous ~~environment~~ or a mixture ~~portion~~ thereof.

7. (Original) The method of Claim 6 wherein the sample is an environmental, industrial or domestic sample.

8. (Currently Amended) The method of Claim 1 ~~or 6~~ wherein the sample is wastewater, water, solid waste, or polluted soil.

9. (Currently Amended) The method of Claim 2 wherein the redox mediator species are selected from the group consisting of ~~comprising~~ zero valence metal species ~~pieces~~, metallic ions, metal-containing oxides, hydroxides, chelates, non-biodegradable and insoluble inorganic constituents with variable oxidation-reduction states, or a and combination ~~combinations~~ thereof.

10. (Currently Amended) The method of Claim 9 wherein the metallic and metal-containing species are ~~include metals~~ selected from the group consisting of ~~comprising~~ iron, nickel, cobalt, manganese, vanadium and combinations thereof.

11. (Currently Amended) The method of Claim 9 ~~or 10~~ wherein the cationic metal is provided as metal salts or metal slurry.

12. (Currently Amended) The method of Claim 9 ~~or 10~~ wherein the microorganisms are iron-reducing microorganisms ~~are~~ selected from the genera consisting of: *Acidobacterium*, *Aerobacter*, *Bacillus*, *Clostridium*, *Deferribacter*, *Desulfuromonas*, *Desulfuromusa*, *Esherichia*, *Ferribacterium*, *Ferrimonas*,

Geobacter, *Geovibrio*, *Geothrix*, *Pantoea*, *Pseudomonas*, *Sulfurospirillum*, *Shewanella*, *Thermoterrabacterium*, *Thermotoga*, and *Thermus*, or a ~~and/or~~ mixed culture cultures thereof of the ~~aforementioned microorganisms~~, or an ~~and/or~~ enrichment culture cultures of the microorganisms capable of reducing ~~to reduce~~ iron (III).

13. (Currently Amended) The method of Claim 9 ~~or 10~~ wherein the microorganisms are iron-oxidizing microorganisms ~~are~~ selected from the genera consisting of *Acidianus*, *Acidithiobacillus*, *Ferroglobus*, *Ferromicrobium*, *Gallionella*, *Hyphomicrobium*, *Leptothrix*, *Naumanniella*, *Ochrobium*, *Leptospirillum*, *Pedomicrobium*, *Rhodovulum*, *Rhodocyclus*, *Siderococcus*, *Sphaerotilus*, *Siderocapsa*, *Sulfolobus*, *Stenotrophomonas*, and *Thiobacillus*, or a ~~and/or~~ mixed cultures of the ~~aforementioned microorganisms~~, or an ~~and/or~~ enrichment culture cultures of the microorganisms capable of oxidizing ~~to reduce~~ iron (II) ~~(III)~~.

14. (Currently Amended) A method for removing or otherwise reducing the level of inorganic ~~and/or~~ organic chemical compounds ~~species~~ in wastewater, surface water, ground water, solid waste, ~~and/or~~ polluted soil, said method comprising subjecting said wastewater, surface water, ground water, solid waste, ~~and/or~~ polluted soil to one or both of anaerobic treatment ~~conditions~~ ~~and/or~~ aerobic treatment ~~conditions~~ wherein the valency of one or more cationic iron species is manipulated by microorganisms, wherein under anaerobic conditions, cationic iron species are reduced to a lower order valency, and under aerobic conditions, cationic iron species are oxidized to a higher order valency by microorganisms, ~~and this in turn facilitates~~ the formation of insoluble particles comprising the chemical species is facilitated.

Claims 15-19. (Cancelled)

20. (New) A method for removing or otherwise reducing the level of inorganic or organic chemicals in an waste sample, said method comprising (1) introducing to said waste sample one or more cationic iron species, and (2) subjecting said waste sample to one or both of anaerobic treatment and aerobic treatment, wherein the valency of one or more cationic iron species is changed by microorganisms where under anaerobic conditions, the cationic iron species are reduced to a lower order valency, wherein under aerobic conditions, the cationic iron species are oxidized to a higher order valency, and wherein the formation of insoluble particles comprising the chemicals to be removed is facilitated.

21. (New) The method according to Claim 20, wherein the waste sample is wastewater, surface water, ground water, solid waste, or polluted soil.

22. (New) The method according to Claim 20, wherein the waste sample is subject to a cycled aerobic-anaerobic treatment scheme.

23. (New) The method according to Claim 20, wherein the waste sample is subject to a cycled anaerobic-aerobic treatment scheme.

24. (New) The method according to Claim 20, wherein the waste sample is subject to a sequential aerobic-anaerobic treatment scheme.

25. (New) The method according to Claim 20, wherein the chemical to be removed is ammonium.

26. (New) The method according to Claim 20, wherein the cationic iron species comprise a ferrous salt or a ferric salt.

27. (New) The method according to Claim 20, wherein the cationic iron species comprises iron ore or iron slurry.

28. (New) The method according to Claim 20, wherein the microorganisms are introduced as activated sludge.

29. (New) A composition for removing or otherwise reducing the level of inorganic or organic chemicals in a waste sample, comprising one or more aerobic or anaerobic iron-reducing microorganisms and a cationic iron compound.

30. (New) The composition according to Claim 30, wherein the microorganisms are encapsulated within the cationic iron compound.

31. (New) A method for assessing the capacity of a system for removing one or more chemicals from a waste sample, wherein the system comprises ionic cation compounds and bioredox microorganisms that are capable of modulating the redox potential of the ionic cation compounds, the method comprising: (1) establishing at least one index value I_v for at least one feature associated with bioredox microorganisms present in the system, and (2) establishing from I_v at least one potency value P_v corresponding to the capacity of the bioredox microorganisms to establish a given redox potential for the ionic cation compound.